

Indian Standard



SPECIFICATION FOR HIGH SPEED TUBELESS TYRES FOR CIVIL AIRCRAFT

PART 2 PERFORMANCE REQUIREMENTS

1. Scope — Covers the minimum performance requirements for new, high speed, tubeless tyres for main/nose wheel of civil aircraft whose ground speeds are greater than 192 km/h (120 mph). These requirements apply to aircraft tyres having speed and load ratings that are established on the basis of speeds and loads to which they have been tested.

2. Materials — Shall be suitable for the purpose and of quality determined on the basis of service experience and/or substantiated by dynamometer tests.

3. Design and Construction — The design and construction requirements to obtain the performance standards shall be as given in 3.1 to 3.8.

3.1 Unbalance — The moment M of static unbalance in inch-ounce units may not be greater than the value determined using the empirical formula:

$$\text{Moment } M = 0.025 D^2$$

where

D = maximum outside tyre diameter in inches rounded off to the next lower whole number.

3.2 Balance Marker — A balance marker consisting of a red dot shall be affixed on the sidewall of the tyre immediately above the bead to indicate the light weight point of the tyre. The dot shall remain for the entire period of storage plus the original tread life of the tyre.

3.3 Overpressure — The tyre shall withstand a pressure of at least 4 times the rated inflation pressure at ambient temperature for at least 3 seconds.

3.4 Ambient Temperature — It shall be substantiated by applicable tests or shown by analysis that the physical properties of the tyre materials have not been degraded by exposure of the tyre to the temperature extremes of not higher than -40°C and not lower than 71°C for a period of not less than 24 hours at each extreme

3.5 Wheel Bead Seat Temperature (Wheel Rim Heat) — It shall be substantiated by the applicable tests or shown by analysis that the physical properties of the tyre materials have not been degraded by exposure of the tyre to a wheel bead seat temperature of not lower than 140°C for at least one hour except that nose-wheel tyres may be tested or analyzed at the highest wheel bead seat temperature expected to be encountered during normal operation.

3.6 Tread Design — Changes in materials that affect performance or changes in number or location of tread ribs and grooves or skid depth increases made subsequent to the tyre qualification, are major changes and shall be substantiated by dynamometer tests covered under IS : 10992 (Part 3)-1984 'Specification for high speed tubeless tyres for civil aircraft: Part 3 Qualification tests'.

3.7 Slippage — Tyres tested in accordance with the dynamometer tests may not slip on the wheel rim during the first five dynamometer cycles. Slippage that subsequently occurs may not damage the tube, valve, or the air seal of the bead of tubeless tyres.

3.8 Leakage — After an initial 12-hour minimum stabilization period, the tyre shall be capable of retaining air pressure with a loss of pressure not exceeding 5 percent in 24 hours from the initial pressure equal to the rated inflation pressure.

3.9 Load Rating — The load ratings of the aircraft tyres shall be established in accordance with the appropriate provisions of IS : 10992 (Part 3)-1984.

3.9.1 Load ratings of aircraft tyres shall be established in accordance with the following provisions:

Main wheel tyres — Load corresponding to the most critical combination of aircraft weight (up to maximum ramp weight), centre of gravity position and the effect of engine thrust reacted by inertia at the aircraft centre of gravity.

For a multi wheel and tyre landing gear arrangement the rated load for each tyre shall not exceed 1.07 times the load mentioned above.

Nose wheel tyres — applicable ground reactions are as follows:

- a) The static ground reaction for the tyre corresponding to the most critical combination of aircraft weight (up to maximum ramp weight) and centre of gravity position with a force of 1.0 g acting downwards at the centre of gravity. The load rating of the tyre shall at least be equal to this load.
- b) The ground reaction of tyre corresponding to the most critical combination of aircraft weight (up to maximum landing weight) and centre of gravity position combined with forces of 1.0 g downwards and 0.31 g forward acting at the centre of gravity. The reactions in this case shall be distributed to the nose and main wheels by the principles of statics with a drag reaction equal to 0.31 times the vertical load at each wheel with brakes capable of producing this ground reaction. The load rating of the tyre shall at least be equal to 1.5 times this load.
- c) The ground reaction of the tyre corresponding to the most critical combination of aircraft weight (up to maximum ramp weight) and centre of gravity position combined with forces of 1.0 g downwards and 0.20 g forward acting at the centre of gravity. The reactions in this case shall be distributed to the nose and main wheels by the principles of statics with a drag reaction equal to 0.2 times the vertical load at each wheel with brakes capable of producing this ground reaction. The load rating of the tyre shall at least be equal to 1.5 times this load.

3.9.2 Rated inflation pressure — The rated inflation pressure shall be established at an identified ambient temperature on the basis of the rated load as established in 3.9.

3.9.3 Loaded radius — The loaded radius shall be the distance from the axle centre line to a flat surface of a tyre initially inflated to the rated inflation pressure and then loaded to its rated load against the flat surface. The nominal loaded radius, the allowable tolerance on the loaded radius and the actual loaded radius for the test tyres shall be identified.

Note — The design and allowable tolerance on tyre deflection shall be specified by the manufacturer.

4. Type Qualification Tests

4.1 Dynamometer Testing Requirements — The tyre shall withstand the applicable dynamometer tests specified in Part 3 of this specification. The tyres shall not have visible signs of deterioration other than normal expected tread wear except as provided in Part 3.

4.2 Requalification Test — Requalification of a specified load rated tyre carried out in accordance with Part 3 of this specification of a specified load rated tyre required as a result of a tread design or material change shall automatically qualify the same changes in a lesser load rated tyre of the same size, speed rating and skid depth, provided:

- a) the lesser load rated tyre has been qualified to the applicable requirements specified, and
- b) the ratio of qualification testing load to rated load for the lesser load rated tyres does not exceed the same ratio for the higher load rated tyre at any given test condition.

EXPLANATORY NOTE

In preparing this standard, considerable assistance has been derived from TSO C 62 C Pt 25, 37 and 91 of the Federal Aviation Administration (FAA) of Department of Transport, USA.

Part 1 of this standard covers the aircraft tyres design requirements, while qualification tests are covered in Part 3.